COMPARISON BETWEEN DESIGN ALTERNATIVES USING BIM-ENABLED CIRCULATION ANALYSIS

HYUNSOO LEE\textsuperscript{1}, JISOO KIM\textsuperscript{2}, MINKYU SHIN\textsuperscript{3} and JIN-KOOK LEE\textsuperscript{4}

\textsuperscript{1,2,3,4} Hanyang University, Seoul, Republic of Korea
\{hyunsoolee120, jicoun, smkzzanggood\}@gmail.com, designit@hanyang.ac.kr

1. Introduction

On the basis of BIM enabled applications, quantitative spatial analysis of building design enables us to compare several design alternatives for design decisions. Such a technique can be provided by automated software interfaces using information-rich dataset from BIM [1]. This research poster aims to represent a BIM-enabled quantitative spatial analysis using an intensive comparison between design alternatives using an actual building remodel project.

2. Research Scope and Objective

BERA (Building Environment Rule and Analysis) Language [2] is one of the BIM-enabled approaches for analyzing spatial objects with precision. The scope of this research is about BIM-based indoor spatial analysis and comparison between design alternatives specifically using BERA Language-enabled quantitative data of building circulation. The execution platform of BERA Language and its tools is SMC (Solibri Model Checker), and its demonstrated target model for test is used as IFC (Industry foundation Classes).

3. Quantitative Data of a Circulation Path

BERA Language as a rule-based script language enables us to convert qualitative design aspects into quantitative numeric data for an explicit comparison between design alternatives. The returned data contains path properties such as number of turns and walking distance of paths so that user can apply those data results regarding to their specific purpose of design analysis.
4. Results of demonstration of actual building remodeling project

An example of comparison between design alternatives is depicted in Figure 1 and Table 1.

![Figure 1. Screenshots of building circulation analysis using BERA Language running on SMC for acquiring quantitative circulation data.](image)

Table 1. An example of comparison between two design alternatives using circulation-related quantitative data

<table>
<thead>
<tr>
<th>Design</th>
<th>Department</th>
<th>Number of Turn</th>
<th>Number of Path</th>
<th>Sum of Walking Distance</th>
<th>Sum of Number of Turn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alt #1</td>
<td>A</td>
<td>17</td>
<td>34</td>
<td>2790.89</td>
<td>389</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>25</td>
<td>50</td>
<td>6533.59</td>
<td>1463</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>27</td>
<td>54</td>
<td>10118.21</td>
<td>2724</td>
</tr>
<tr>
<td>Alt #2</td>
<td>A</td>
<td>19</td>
<td>38</td>
<td>3614.21</td>
<td>477</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>23</td>
<td>46</td>
<td>7495.24</td>
<td>1782</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>23</td>
<td>46</td>
<td>10960.97</td>
<td>2936</td>
</tr>
</tbody>
</table>

5. Summary

We proposed and demonstrated a quantitative analysis approach to the comparison between design alternatives using BIM-enabled circulation analysis. It is possible to suggest objective value of building circulation for helping to choose most efficient design among the other design alternatives. Its expendability and applicability can be able to affect succeeding study of quantitative design analysis.

Acknowledgements

This work was supported by the National Research Foundation of Korea Grant funded by the Korean Government (NRF-2012S1A5A8024881).

References